

chemical mechanical polishing, said method comprising the steps of

defining a closed space between the polishing surface of the object polished and the polishing pad and

5 polishing the polishing surface in a state wherein the polishing agent kept in said closed space.

21. A polishing method as set forth in claim 20, comprising

a step of holding the object to be polished in
10 a holding recess of the polishing head and

a step of bringing a close contact portion formed at a periphery of said holding recess into full contact with the polishing pad to define the closed space between the polishing surface and the polishing pad.

15 22. A polishing method as set forth in claim 20, wherein said polishing head

has a feed port for feeding the polishing agent from a polishing agent receiving portion into the closed space and a valve for opening and closing the feed port,

20 opens the valve to feed the polishing agent between the polishing surface of the object and the polishing pad, and

closes the valve in the state where the polishing agent fills the closed space.

25 23. A polishing method as set forth in claim 21,

further comprising the steps of

providing in a holding recess of the polishing head a holding diaphragm which is provided so as to form with the holding recess a feed space to which a
5 predetermined fluid is supplied, which is formed by a diaphragm which is deformed by a pressure of the fluid, and which is provided with a facing surface portion facing a back surface of the polishing surface of the object to be polished and a fitting surface portion
10 integrally formed with the facing surface portion and fitting with the outer circumference of the object to be polished and

feeding the fluid in the feed space so as to press the outer circumference of the object to be polished against the fitting surface portion to hold the
15 object to be polished.

24. A polishing method as set forth in claim 23, further comprising a step of feeding the fluid to the feed space to uniformly press the back surface of the
20 polishing surface of the object to be polished against the facing surface portion of the holding diaphragm.

25. A polishing method as set forth in claim 20, further comprising a step of polishing while imparting vibration to the polishing agent.

25 26. A polishing method as set forth in claim 25,

further comprising a step of operating an ultrasonic oscillator built into a polishing pad holding member holding the polishing pad to impart the resultant ultrasonic vibration to the polishing agent held between
5 the polishing pad and the polishing surface of the object to be polished.

27. A polishing method as set forth in claim 25, further comprising a step of imparting vibration to a polishing agent in a polishing agent feed tank for
10 feeding the polishing agent.

28. A polishing method as set forth in claim 20, wherein the polishing agent comprises a mixture of potassium hydroxide and silicon dioxide.

29. A polishing method as set forth in claim 25,
15 further comprising a step of imparting vibration to a feed pipe for continuously feeding pure water on to the polishing pad and propagating the vibration to the polishing agent on the polishing pad by the pure water fed on to the polishing pad through the feed pipe.

20 30. A polishing method in which a polishing head and a polishing pad are pressed together and are made move relative to each other in a state where a polishing agent is interposed between a polishing surface of an object to be polished held by the polishing head and the
25 polishing pad so as to flatten the polishing surface by

chemical mechanical polishing, said method a step of comprising imparting vibration to the polishing agent.

31. A polishing method as set forth in claim 30, further comprising a step of operating an ultrasonic
5 oscillator built into a polishing pad holding member holding the polishing pad to impart the resultant ultrasonic vibration to the polishing agent held between the polishing pad and the polishing surface of the object to be polished.

10 32. A polishing method as set forth in claim 30, further comprising a step of imparting vibration to a polishing agent in a polishing agent feed tank for feeding the polishing agent.

33. A polishing method as set forth in claim 30,
15 further comprising a step of imparting vibration to a feed pipe for continuously feeding pure water on to the polishing pad and propagating the vibration to the polishing agent on the polishing pad by the pure water fed on to the polishing pad through the feed pipe.

CLAIMS

1. A polishing apparatus which presses together and makes move relative to each other an object to be polished held at a polishing head and a polishing pad in
5 a state where a polishing agent is interposed between a polishing surface of the object and the polishing pad so as to flatten the polishing surface of the object by chemical mechanical polishing,

the polishing head comprising:

10 a polishing agent receiving unit for receiving the polishing agent,

a holding means for holding the object to be polished in a holding recess in the polishing head,

15 a contact portion which is positioned at the periphery of the holding recess and is fully contacted to the polishing pad to define a closed space for positioning the polishing agent between the polishing surface of the object to be polished and the polishing pad,

20 a polishing agent feed control means for controlling the feed of the polishing agent from the polishing agent receiving port into the closed space in response to the amount of the polishing agent in the closed space.

25 2. A polishing apparatus as set forth in claim 1,

wherein:

the polishing agent feed control means comprises a feed port for feeding the polishing agent from the polishing agent receiving portion into the closed space, and a valve means provided with a valve for opening and closing the feed port.

3. A polishing apparatus as set forth in claim 1, wherein:

the holding means has in a holding recess of the polishing head a holding diaphragm which is provided so as to form with the holding recess a feed space to which a predetermined fluid is supplied, which is formed by a diaphragm which is deformed by a pressure of the fluid, and which is provided with a facing surface portion facing a back surface of the polishing surface of the object to be polished and a fitting surface portion integrally formed with the facing surface portion and fitting with the outer circumference of the object to be polished and

the fitting surface portion of the holding diaphragm wafer presses the outer circumference of the object to be polished by the pressure of the fluid fed to the feed space to hold the object to be polished.

4. A polishing apparatus as set forth in claim 3, wherein the facing surface portion of the holding

diaphragm presses the back surface of the polishing surface of the object to be polished held by the fitting surface portion against the polishing pad by the pressure of the fluid fed to the feed space.

5 5. A polishing apparatus as set forth in claim 4, wherein the fluid comprises the polishing agent.

6. A polishing apparatus as set forth in claim 2, further comprising a vibration imparting means for imparting vibration to the polishing agent.

10 7. A polishing apparatus as set forth in claim 6, wherein

the vibration imparting means comprises an ultrasonic oscillator built into a polishing pad holding member holding the polishing pad and

15 ultrasonic vibration is imparted to the polishing agent held between the polishing pad and the polishing surface of the object.

8. A polishing apparatus as set forth in claim 7, wherein the ultrasonic oscillator built into the
20 polishing pad holding member is arranged corresponding to a predetermined region of movement of the object on the polishing head.

9. A polishing apparatus as set forth in claim 6, wherein the vibration imparting means is provided at a
25 polishing agent feed tank for feeding the polishing

agent.

10. A polishing apparatus as set forth in claim 1, wherein the polishing agent contains a mixture of potassium hydroxide and silicon dioxide.

5 11. A polishing apparatus as set forth in claim 6, wherein

said polishing apparatus further comprises a feed pipe for continuously feeding pure water on to the polishing pad,

10 the vibration imparting means is provided at the feed pipe, and

the vibration is propagated to the polishing agent on the polishing pad by the pure water fed on to the polishing pad.

15 12. A polishing apparatus as set forth in claim 11, wherein

the polishing pad is driven to rotate about a predetermined shaft,

20 the polishing head is driven to rotate at a position offset from the center of the polishing pad, and

the pure water feed pipe feeds pure water to the proximity of the center of the polishing pad.

25 13. A polishing apparatus which presses together and makes move relative to each other a polishing head and a polishing pad in a state where a polishing agent is

interposed between a polishing surface of an object to be polished held by the polishing head and the polishing pad so as to flatten the polishing surface of the object by chemical mechanical polishing, said polishing apparatus
5 comprising a vibration imparting means for imparting vibration to the polishing agent.

14. A polishing apparatus as set forth in claim 13, wherein

the vibration imparting means comprises an
10 ultrasonic oscillator built into a polishing pad holding member holding the polishing pad and

ultrasonic vibration is imparted to the polishing agent held between the polishing pad and the polishing surface of the object.

15 15. A polishing apparatus as set forth in claim 13, wherein the ultrasonic oscillator built into the polishing pad holding member is arranged corresponding to a predetermined region of movement of the object to be polished on the polishing head.

20 16. A polishing apparatus as set forth in claim 13, wherein the vibration imparting means is provided at a polishing agent feed tank for feeding the polishing agent.

25 17. A polishing apparatus as set forth in claim 13, wherein

said polishing apparatus further comprises a feed pipe for continuously feeding pure water on to the polishing pad,

the vibration imparting means is provided at
5 the feed pipe, and

the vibration is propagated to the polishing agent on the polishing pad by the pure water fed on to the polishing pad.

18. A polishing apparatus as set forth in claim 17,
10 wherein

the polishing pad is driven to rotate about a predetermined shaft,

the polishing head is driven to rotate at a position offset from the center of the polishing pad, and

15 the pure water feed pipe feeds pure water to the proximity of the center of the polishing pad.

19. A polishing apparatus as set forth in claim 1, wherein the object to be polished is a semiconductor substrate.

20 20. A polishing method in which an object to be polished held at a polishing head and a polishing pad are pressed together and are made move relative to each other in a state where a polishing agent is interposed between a polishing surface of the object polished and the
25 polishing pad so as to flatten the polishing surface by